

# **12 Lead ECGs: Axis Determination & Deviation**

## **Axis Determination & Deviation**

- ◆ **Why Axis Determination?**
- ◆ **Definitions**
- ◆ **Axis Quadrants**
- ◆ **Axis Determination**
- ◆ **Axis Deviation**
  - **Physiologic vs Pathologic**

## Axis Determination & Deviation

- ♦ Why Axis Determination?
  - *“Paramedics don’t need to know this”*
- ♦ The ability to identify hemiblocks (“fascicular blocks”) is the main reason you need to be able to determine axis
  - *“But paramedics don’t need to know this either”*

**Should they know this?**

## Axis Determination & Deviation

**“It is my opinion that the inability to determine the presence of a hemiblock has often been the cause of complete heart block when well-intentioned caregivers have improperly administered lidocaine”**

Mike Taigman, “Taigman’s Advanced Cardiology”,  
Brady, 1995, p. 71

## Axis Determination & Deviation

- ◆ **What is Axis?**
  - “the general (mean vector) direction of electrical impulses as they travel through the heart”
  - “the sum total of all electrical currents generated by the ventricular myocardium during depolarization”
  - normally from upper right to lower left

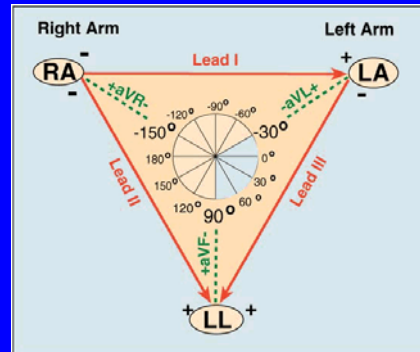
## Axis Determination & Deviation

- ◆ **What do you need to determine the axis of an ECG?**
  - **The 12 Lead ECG**
  - **Leads CORRECTLY placed on the patient**
    - ◆ RA on the right arm
    - ◆ LA on the left arm
    - ◆ LL on the left leg
    - ◆ Not on the chest or abdomen
  - **Knowledge of axis deviation**

# Axis Reference

## Hexaxial Reference System

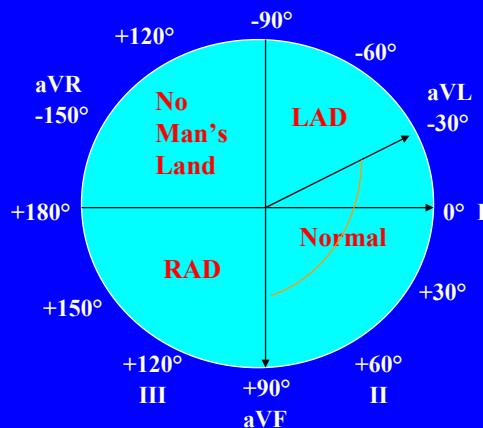
- The six frontal leads create six poles that intersect at the center of the heart
- Each pole has a positive & negative axis
- Each + and - end is assigned a value expressed in degrees
- Hexaxial then divided into quadrants (easier to use)



# Axis Quadrants

## Quadrants

- Left axis  
-30 to -90 °
- Normal axis  
-30 to 90 °
- Right axis  
90 to 180 °
- Extreme Right axis or “No Man’s Land”  
-90 to 180 °



## Axis Determination

### ♦ Quick Axis Determination

- Determine the net QRS deflection in Leads I and aVF (positive or negative)

	Lead I	aVF
Normal axis	▲	▲
LAD	▲	▼
RAD	▼	▲
ERAD	▼	▼

## Axis Determination

### ♦ Estimating Axis Quickly

- Determine the net QRS deflection in leads I and aVF (positive or negative)
  - ♦ If the net QRS in Lead I is nearly the same as aVF, then axis midway between or  $45^\circ$ 
    - ❖ We estimate by calling it, "between  $+40^\circ$  and  $+50^\circ$ "
  - ♦ If the net QRS in Lead I is positive and is obviously greater than aVF, then axis closer to lead I
    - ❖ Estimate as "Between  $0^\circ$  and  $40^\circ$ "
  - ♦ If the net QRS in aVF is positive and greater than Lead I, then axis is  $+50^\circ$  and  $+90^\circ$

# Axis Deviation

## ◆ Pathologic vs Physiologic LAD

### ● First step

- ◆ Do I have LAD?
- ◆ If yes, then proceed on

### ● Look at Lead II

- ◆ If the net QRS deflection is **more negative** than positive, then the axis must be **MORE NEGATIVE** than  $-30^\circ$